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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,191	12/12/2003	Julia Wan-Ping Hsu	Hsu 4-5	2613

7590 07/08/2005

Docket Administrator (Room 3J-219)  
Lucent Technologies Inc.  
101 Crawfords Corner Road  
Holmdel, NJ 07733-3030

EXAMINER

NGUYEN, JOSEPH H

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 07/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/735,191

Applicant(s)

HSU ET AL.

Examiner

Joseph Nguyen

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 and 5-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Ikeda (US 6,312,967).

Regarding claim 1, Ikeda discloses on figure 2 an apparatus comprising a crystalline substrate 1 (col. 4, line 4) having a top surface; a crystalline semiconductor layer 2, 3 (col. 4, lines 1-2) comprising group III-nitride being located on the top surface, the crystalline semiconductor layer having first and second surfaces, a plurality of lattice defects M (col. 4, line 9) having first ends on the first surface, the second surface being separated from the top surface by semiconductor of the crystalline semiconductor layer, the entire portion of the first surface between the defects being next to the top surface and a plurality of dielectric regions 4a (col. 4, lines 34-37) located on the second surface, each defect threading the crystalline semiconductor layer and having a second end covered by a different one of the dielectric region, each dielectric region being distant from other dielectric regions.

Note that each defect herein is referred to the defect in the central and side portions as shown in figure 2 of Ikeda that has its second end covered by a different one

of the dielectric region 4a. Further, since elements 2,3 are formed of the same crystalline semiconductor material (GaN), they are considered "crystalline semiconductor layer".

Regarding claim 2, Ikeda discloses the crystalline substrate is lattice mismatched to the crystalline semiconductor layer. Note that the crystalline substrate 1 is formed of sapphire (col. 4, lines 4-5) while the crystalline semiconductor layer 2, 3 is formed of GaN (col. 4, lines 1-2). Therefore, they are lattice mismatched.

Regarding claim 3, Ikeda discloses on figure 2 each dielectric region 4a is a cap covering a single threading defect M.

Regarding claim 5, Ikeda discloses the dielectric regions 4a comprise metal oxide (col. 4, lines 35-37).

Regarding claim 6, Ikeda discloses the group III-nitride comprises Ga (col. 4, lines 1-2).

Regarding claim 7, Ikeda discloses the lattice-mismatched substrate 1 comprises sapphire (col. 4, lines 4-5).

Regarding claim 8, it is inherent a concentration of metal atoms in the lattice defects M is higher than in surrounding semiconductor matrix of the crystalline semiconductor layer 2, 3. Applicant admitted in page 1, lines 22-26 a threading defect has a higher conductivity than bulk semiconductor and thus, carries more current through a layer than defect free semiconductor surrounding such a defect. A higher conductivity means a higher metal concentration in the threading defect therein.

Regarding claim 9, Ikeda disclose on figure 1 (the same embodiment as figure 2) a conductor 16 (col. 5, line 62) with the second surface and configured to transmit a current to the layer 2, 3. Note that the conductor 16 is electrically in contact with the second surface of the layer 2,3.

Regarding claim 10, Ikeda discloses on figure 2 the lattice defects M are electrically passivated via 4a.

Regarding claim 11, Ikeda discloses the top surface (of the substrate 1) is planar.

Regarding claim 12, Ikeda discloses the substrate 1 is c-plane sapphire (col. 4, lines 4-5).

Regarding claim 13, Ikeda discloses on figure 2 the second surface of the crystalline semiconductor layer 2, 3 is smooth.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda, and further in view of Camras et al. (US 6,784,463).

Regarding claim 4, Ikeda discloses the caps 4a comprises aluminum oxide (col. 4, lines 35-37). Ikeda does not disclose the caps comprise oxide of gallium. However, Camras et al. discloses the caps 117 can be alternatively formed of aluminum oxide or

gallium oxide (col. 5, lines 9-14). In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ikeda by having the caps comprising oxide of gallium because they are recognized in the art as equivalents.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-13 have been considered but are moot in view of the new ground(s) of rejection.


### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (571) 272-1734. The examiner can normally be reached on Monday-Friday, 7:30 am- 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300 for regular communications.

Art Unit: 2815

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JN  
June 28, 2005.

  
TOM THOMAS  
SUPERVISORY PATENT EXAMINER